

5-30-96  
12.3.8v.6

Author: Hans Steuch at AGC-PDX  
Date: 5/30/96 10:58 AM  
Priority: Normal  
TO: Chuck Wiedenhoft at AGC-OP  
CC: Henrik Voldbaek at AGC-SEA  
CC: Mike Hrizuk at AGC-DUR  
CC: Bill Siemering  
CC: Ken Rone  
CC: Doug Hale  
Subject: Iron Slag

----- Message Contents -----

Chuck:

Thank you for the copy of your e-mail of 5/25 to Henrik Voldbaek and Mike Hrizuk about the subject matter. I have agreed with the recipients of your memo to respond on their behalf.

Following successful passage of the Western Region's January 1993 "Standard Procedure for Evaluation and Acceptance of Waste Materials as Plant Raw Materials" (updated copy attached), the Seattle plant started using Cominco slag during the second quarter of 1995. Durkee started using it a few weeks ago. The slag constitutes three to four percent of the mix at both plants.

With regards to regulatory concerns, the Cominco slag does indeed come from a lead and zinc smelter in British Columbia. In addition to Cominco's leachate data and Material Safety Data Sheet, Ash Grove's research lab ran a Toxic Characteristics Leachate Procedure analysis on a sample (R&E No. S-950319) of the slag. The results, from May last year, showed all metals below the regulatory limits. The highest were antimony at 16 percent of the limit and lead at 13 percent of the limit. The material was also reviewed for conformance with State of Washington Dangerous Waste Regulations (WAC 173-303) and found to pass them as a non-hazardous material.

A typical analysis by Cominco of the absolute content of volatile metals in the slag shows the following:

Metal	average ppm	range, ppm
Mercury	*	*
Selenium	*	*
Thallium	<10	*
Cadmium	6	1-30
Lead	500	300-1,000
Selenium	200	100-400

Data are not available for the asterisked cells; but since the slag has been subjected to high temperatures, I expect that the levels are very low. The TCLP test showed mercury at 1 percent of the regulatory limit and selenium and thallium below the limit of detection.

Any potential health concerns can be addressed as follows.

We do not have heavy metals analysis of the Seattle and Durkee raw materials. There was never a business reason to make a complete heavy metals material balance for them. Durkee's kiln feed was

AGC2E000269

USEPA SF



1279426

analyzed in 1990 by the Research Laboratory for cadmium and lead as part of a company wide heavy metals study. Comparing this analysis with the typical addition of cadmium and lead from the slag, one sees that the slag increases the kiln feed content of cadmium from 1.3 to 1.5 ppm and of lead from 15 to 30 ppm.

An analysis of the heavy metals content of cement from Durkee and Seattle conducted by the research Laboratory during the first part of 1995 (before Cominco slag became part of the raw mix) shows cadmium and lead below the detection level of 5.2 ppm and 6.3 ppm respectively for both plants. The cadmium limit of detection on this particular analysis is pretty high considering that cements in the Portland Cement Association's 1992 study showed an average content of 0.34 ppm cadmium. The average lead content in that same study was 12 ppm. My point is that even if the lead content of Durkee's kiln feed has been doubled by the Cominco slag, it can only be expected to have changed the lead content in the cement from low to average.

As regards the heavy metals content of the recirculated kiln dust in these two plants, it has not been determined recently. The 1990 Research Laboratory study mentioned above also determined there to be 2.06 ppm cadmium and 15.9 ppm lead in the Durkee dust. These concentrations may have been doubled by the Cominco slag which replaced mill scale at Durkee. The concentration levels that are of health concern (shown in Table 5.1 of Environmental Science and Engineering's 1991 study for the Cement Kiln Recycling Coalition) are one to two orders of magnitude higher.

Zinc can affect cement and concrete performance. The zinc content was initially reported by Cominco to be upwards of 3.5 % which would add about 0.1 % zinc oxide to the clinker. Pat Noon continues to watch the zinc levels. He reports they have run lower than expected and have not affected cement quality.

Hope this answers your query. If not, let me know.